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THE CARBONIFEROUS ROCKS NEAR GARRISTOWN, CO. DUBLIN, AND IN THE ADJACENT PART OF CO. MEATH

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THE CARBONIFEROUS ROCKS NEAR GARRISTOWN, CO. DUBLIN, AND IN THE ADJACENT PART OF CO. MEATH.

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JOHN E. SCANLON.

(Communicated by G. F. MITCHELL).

Plate 12.

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INTRODUCTION.

THE area described in this paper covers about 12 square miles in the vicinity of Garristown, which is situated in the north-west corner of County Dublin, and is approximately 17 miles north-north-west of Dublin, and 12 miles west of Skerries on the coast. The area extends west into County Meath (see map Pl. 12).

In the area Namurian strata of E_2 age have been found in a pitching synclinal fold, which has been truncated by the Crossmacool Fault to the west, and so forms a semi-circular outlier surrounded on all sides by Lower Caboniferous rocks of Dinantian age. The Balbriggan Lower Palæozoic massif lies to the north of the area, and consists of rocks of Silurian age.

The rocks in the area show close correlation with those exposed further east in North County Dublin (SMYTH 1950), and it is the purpose of this Paper to show the correlation of, and to give an account of, the westward continuation of the region mapped by Professor Smyth. Thus Arnsbergian (E_2) sandstones found in the area may be correlated with the Balrickard Sandstones Series exposed further east, and rocks of Pendleian (E_1) age are apparently absent, a fact which may be related to the Sudetian earth movements.

Upper Bollandian (P_2) rocks surround the synclinal Namurian basin on the east, and are represented by argillaceous limestones and shales corresponding to the Loughshinny decalcified black shales of the coast (MATLEY & VAUGHAN, 1908). Lower Bollandian (P_1) rocks are present surrounding the younger Carboniferous rocks on the east, and abutting against them to the west of the Crossmacool Fault. C_2–D_1 grey limestones are exposed in the south-east of the area, and are presumed to extend across north County Dublin to join up with those further east.

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Dr. W. E. Nevill and Dr. D. H. Oswald all who gave much helpful criticism and kind assistance, and to the late Professor Smyth who gave many hints and kind words of encouragement, the author is indeed deeply grateful.

Topographical.

Garristown Hill (556 feet), just south-west of Garristown, forms the most elevated part of the area, and from it, a ridge over 300 feet, extends about 2¼ miles north-west, elsewhere the land slopes away on all sides to below 300 feet.

The river Delvin rises north of Garristown Hill and flows east through an alluvial flat bounded by the low upland of the Silurian rocks to the north. The marshy conditions which prevailed in the low valley floor of the Delvin stream at the time of the original Geological Survey (1859) have disappeared due to extensive drainage schemes.

On the west of the area, the main Dublin-Ashbourne road runs north-north-west following the low-lying ground. Below 300 feet, and in some places above this level, the area is deeply covered by glacial drift, through which some of the streams flowing out from Garristown Hill have revealed rock sections down to the 300 foot contour.

The majority of exposures are therefore above 300 feet, comprising three stream sections, various isolated outcrops, and strata exposed in quarries, most of which are old and partly overgrown, and in which the shales have become completely rotten and unfossiliferous.

Historical.

Most of the area lies in the north-east corner of the one inch Geological Sheet No. 101, though it is continued in the adjacent sheet to the east and also in Sheet No. 91 to the north.

In the accompanying Memoirs, published in 1860, the Carboniferous is sub-divided into four lithological units :—

4. Coal Measures. (" Millstone Grit and Yoredale Beds " on the 1902 edition of Sheet 101).

3. Upper Limestones.

2. Calp or Middle Limestones, not distinguishable from 3.

1. Lower Limestone. (" Grey Crystalline Limestone " on the 1902 edition of Sheet 101).

In the Memoir (Du Noyer 1860) the Upper Limestones were stated as being " not more than 300 feet in the Garristown region " and they were said to " pass up by a gradual change in lithological character into the super incumbent Coal Measures." Since the Survey divisions are based on lithology it is difficult to

correlate them with the present zoned rocks, though the junction between the Upper Limestones and the Coal Measures on the east of the area approximates to that of the present Upper Bollandian (P_2), Lower Bollandian (P_1) junction in the same area.

Concerning the Silurian/Carboniferous junction, Du Noyer, who surveyed the area, admitted that it was purely inferential, being concealed by superficial deposits.

THE ARNSBERGIAN, E_2.

The sandstones in the area may be correlated with the Balrickard Sandstone Series further east. They are quite well exposed in two stream sections, one of which is the "Newtown stream section." In this section the transition from lower P_2 shales and argillaceous limestones up into the E_2 sandstones can be seen as one works downstream. The transition is gradual, with alternations of sandstone, siltstone, and shale, giving place gradually to massive sandstone with occasional shale partings (see text figure). The sandstone, which weathers yellow-grey in colour and micaceous, is exposed for some 130 yards along the stream. At G41, 1,000 yards west of Newtown House, at least 20 feet of black shale and mudstone succeed the massive sandstone. The shale and mudstone may be due to the incoming of the depositional conditions which gave rise to what Professor Smyth has termed the "Walshestown Shale Series" further east in North County Dublin. The lamelli-branch-goniatite fauna found in the shales of G41 suggest an E_2 age for the massive sandstone and shale series, though most of the goniatites were very poorly preserved :—

Posidonia membranacea McCoy.
Posidoniella laevis Brown.
P. cf. *corrugata* R. Etheridge, jun.
P. cf. *elongata* Hind.
Anthracoceras cf. *discoides* Bisat.
Anthracoceras sp.
Cravenoceras sp.

Cordaites sp.

Up stream from G41 no fossils were found until G38, a disused quarry, which yielded a fauna indicative of the P_2 zone. No indication was seen of an E_1 fauna, whose absence may be related to the Sudetian earth movements, though no unconformity was seen between the Dinantian and the Namurian. All along the Newtown stream section the dip is in an north-north-westerly direction, increasing gradually downstream.

Further north a stream flowing north-west has exposed hard grey calcareous sandstone and shale; the sandstone is similar in lithology to that exposed in the

Newtown stream section, while the intervening black shale at G54 has revealed a fauna similar to that found at G41. Fauna :—

Posidonia membranacea McCoy.
Posidoniella cf. *vetusta* Sowerby.
Posidonomya aff. *wapanuckensis* Girty.
Cravenoceratoides stellarum Bisat.
Cravenoceras sp.
Fragment of an Orthocone Nautiloid.

Isolated outcrops of similar sandstone occur further north at G67, a group of overgrown quarries. Unfortunately no outcrops are visible towards the centre of the semi-cicular Namurian outlier, outcrops which might confirm the presence of shales equivalent to the " Walshestown Shale Series."

The Upper Bollandian P_2.

Rocks of this age surround the Namurian outlier to the east, and are exposed for more than half a mile along the bed of a stream flowing south of, and parallel to the Newtown stream section.

Although strata are visible for more than half a mile the beds are repeated several times due to folding, thus the first beds visible at the 300 foot contour are hard impure limestone beds and interspersed friable black shales, which are repeated several times further upstream. Changes in dip direction indicate a north-east/south-west axis of folding.

At G44, which occurs about 25 yards upstream from the first exposure, numerous impressions of lamellibranchs were found among the shales, including :—

Posidonia membranacea McCoy.
Posidoniella laevis Brown.
P. cf. *rugata* Jackson.
P. cf. *elongata* Hind.
P. cf. *corrugata* R. Etheridge, jun.
P. minor Brown.
Posidonomya aff. *wapanuckensis* Girty.
Orthoceras sp.

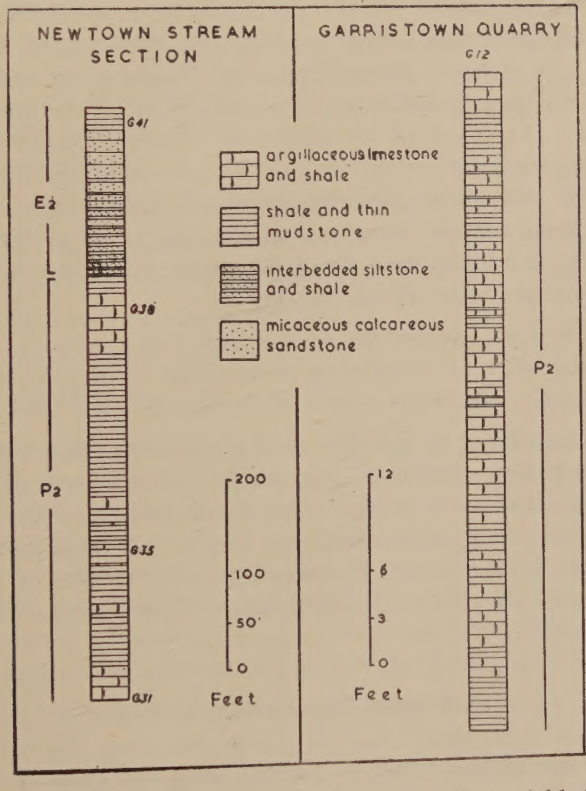
No goniatites or any other zonal fossils were found at his locality or further upstream, the shales being rotten and very friable, though occasional lamellibranch impressions identified as similar to those given above were found. Argillaceous and decalcified limestones occur together with the shales, but these yielded no fossils.

About $3\frac{1}{2}$ feet of rotten black shale and decalcified limestone was observed in a recently dug pit, G30, 500 yards east of Newtown House. The stratae, which

dip south-east at 32°, are unfossiliferous. The whole of the surrounding area is deeply covered by drift. Nearer Newtown House, however, at G86, rocks exposed in a deep ditch consist of rotten black shale and occasional very hard argillaceous and decalcified limestone. The shales yielded poorly preserved and much stained lamellibranchs identified as *Posidonia cf. corrugata Posidoniella cf. elongata* and *P. rugata*. The rocks are exposed for about 25 yards, dipping constantly north-east at 12°.

Locality G31, 580 yards south-west of Newtown House, forms the lowest stratigraphical horizon in the Newtown stream section, which continues for a distance of 585 yards downstream, exhibiting a vertical thickness of some 650 feet of strata. Throughout the Newtown stream section the direction of dip varies little, being north-north-west and increasing gradually from 24° to 58° downstream.

At G31, intermittent exposures of thick beds of very hard grey impure limestone are probably intercalated with shale, though the latter is not seen. Downstream mudstones and shales are exposed as well as the limestones, and still further downstream the shales become dominant (see text figure).



Locality G35, 110 yards downstream from G31, has yielded *Cordaites*, while G38, a disused and partly overgrown quarry, 230 yards further downstream, has

yielded numerous lamellibranchs, *Posidoniella laevis, P. cf. corrugata, P. cf. elongata* in abundance, together with *Cordaites* and very crushed specimens of *Sudeticeras sp.* The shales contain much iron pyrites, which weathers to give a highly coloured surface.

Further downstream the Namurian sandstone is exposed, and the gradual transition from the alternating sandstones, siltstones and shales to massive sandstone, with occasional shale partings, can be seen.

At G88, situated just north of the Newtown stream section, rotten black shales are exposed in a disused quarry ; these shales, which are unfossiliferous, are similar to those seen in the Newtown stream section. Other rocks correlated with part of the Newtown stream section are seen at G91, about 370 yards north-west of Newtown House. They showed the same alternation of impure limestone and rotten black shale and were intermittently exposed upstream for over 150 yards. The dip is in a north-north-westerly direction from 35° to 50°, increasing gradually upstream. These exposures yielded no fossils, nor were any fossils found at isolated outcrops of similar lithology at G8, G6, or G5, outcrops which occur in ditches on the south flank of Garristown hill.

North-west of Garristown a large quarry, G12, on the south side of the road, exposes some 45 feet of strata (see text figure). The strata are almost horizontal at the north end of the quarry, while some 100 yards away, at the south end, they dip south-east at 18°. They consist of hard grey earthy limestones, usually thick bedded, alternating with soft rotten black shales. In some beds the limestone is of a purer nature, but still contains a certain amount of argillaceous material. Some of the bands of shale contain abundant remains of the lamellibranch—*Posidonia membranacea.* No other fossils were found, but numerous argillaceous nodules in the shales may indicate previous organic remains.

An old quarry, G15, exposes the same general succession of rocks as seen at G12. It is situated less than one quarter of a mile north of Garristown on the east side of the main road. The strata, which are incompetently folded, dip east at 20°.

Rocks, probably also of P_2 age, are found at G58, 875 yards north, and slightly west of, Pluckhimin Cross Roads. They consist of hard grey impure limestones and mudstones with occasional shales. Similar beds are exposed at G59, 125 yards south-west. G60, a small partly overgrown quarry 100 yards north-west of G59, reveals the same rock succession. The only remaining locality in this group is at G69, a ditch situated 580 yards east of Piercetown House, containing rotten black unfossiliferous shale.

The Lower Bollandian P_1 (D_2).

Rocks of this age cover a larger part of the area than those of any other zone. They are exposed in a small, partly overgrown, quarry at G49, 1,000 yards west of Tobergregan House, and consist of eight feet of hard grey impure limestone with

thin interbedded rotten black shale layers, and a $2\frac{1}{2}$ foot band of grey crinoidal limestone which yielded :—

Actinoconchus cf. *planosulcatus* Phillips.
Martinia glabra Martin.
Productus (*Dictyoclostus*) sp.
Productus cf. *furcatus* Muir Wood.
P. insculptus Muir Wood.
Pustula pustulosa Phillips.
Stenopora dubia McCoy.

100 yards south-east of Tobergregan House is another small overgrown quarry, G22, which exposes about 25 feet of very hard dark grey impure limestone with thin black rotten shale partings and impure decalcified limestone. Similar beds are seen 100 yards further east at G23, together with a bed of crinoidal limestone. At all these outcrops the dip is constant at 38° in a north-westerly direction.

G25, a quarry 430 yards north-east by north from Tobergregan House, contains hard dark grey limestone with occasional remains of *Posidonia laevis*, also layers of black unfossiliferous shale and a richly fossiliferous crinoidal limestone band about nine inches thick ; this latter yielded :—

Beyrichiceras sp.
Choetetes sp.
Chonetes cf. *buchiana* De Koninck.
Goniatites maxima. Bisat.
Part of an orthocone Nautiloid.
Productus productus Martin.
P. cf. *setosus* Phillips.
Stenopora sp.

In the sourth-west corner of the area, G76, an old quarry, 1,250 yards north of Robinson's Cross Roads, exposes hard grey limestones and shales together with a hard, eight foot band, of crinoidal limestone which yielded *Spirifera bisulcata* Sowerby and fragments of *Productus sp.* The quarry is cut into a local anticline with an north-east/south-west axis. A larger quarry, G75, occurring 670 yards north-west of this, reveals similar strata though no crinoidal limestone is exposed. Hard grey limestones and shales are again seen over half a mile south-east of G76, where another quarry has exposed a local anticlinal fold with a similar axis.

A long triangular area of D_2 limestones is bounded by the Crossmacool Fault to the east, where D_2 rocks adjoin the E_2 and P_2 horizons, and another smaller fault to the west, which brings D_2 rocks in contact with Silurian grits and shales.

Three exposures, G74, G70, and G50, occur in this long triangular faulted area.

G74, a recently opened quarry 580 yards north of Piercetown House, exposes very thickly bedded crystalline limestones dipping south at 32° and containing large pockets of fossils, mostly Productids. The occurrence of these pockets of fossils, together with the lithology of the rock and its light grey colour suggests a reef limestone. Fauna :—

Martinia glabra Martin, abundant.
Reticularia lineata Martin.
Productus antiquatus J. Sowerby.
P. hindi, var *wettonensis* Muir Wood.
P. insculptus Muir Wood.
P. productus Martin.
P. cf. *setosus* Phillips.
Pustula punctata Martin.
Schizophoria resupina Martin.
Spiriferina bisulcata Sowerby.

G70, 250 yards south of Piercetown House, is a delapidated cutting in grey limestones, which dip south at 22°, and includes a hard grey protruding mass of limestone, partly overgrown and in places altered to dolomite. No fossils were found, though they may have been obliterated by dolomitisation.

G50, known as " Hoare Rock " is about one mile south of Piercetown House and just west of the Crossmacool Fault. It is an isolated rounded exposure of hard massive grey unbedded crystalline limestone about ten feet hight and partly overgrown. Some fossils were obtained on its exposed northern side where weathering has softened the surface of the rock. The majority of the fossils contain clear crystalline calcite. The dip was undeterminable in this outcrop, which has been split up into huge blocks by vertical partings. Fossils found include :—

Productus derbiensis Muir Wood.
P. cf. *aculeatus* Martin.
Schelwienella sp.

The Grey Limestones, C_2 —D_1.

Limestones of this age were found in the south-east of the area at G26, an overgrown quarry about one mile south-south-east of Garristown. It contains thick beds of very hard grey limestone and also a crystalline limestone which yielded many coral remains, these were of the two corals *Dibunophyllum cf. bourtonense* and *Lithostrotion cf. clavaticum*. Fragments of *Chonetes sp.* and *Productus sp.* were also obtained from this hard limestone.

No other exposures of these C_2—D_1 zones were found in the Garristown area, but the limestones probably extend eastwards beneath the drift-covered lowland, and join up with the Grey Limestones of North County Dublin.

STRUCTURE AND STRATIGRAPHY.

The structure of the area is a pitching syncline with an east/west axis truncated in the west by the Crossmacool Fault, causing Namurian strata to be preserved in a semi-circular outlier abutting against Dinantian rocks on the west. The Crossmacool Fault was the only fault recognised by Du Noyer, who surveyed the area prior to 1860. No accurate estimate of the throw of the fault can be made, though it must be in the region of 2,000 feet.

The Namurian sandstones are surrounded to the east by rocks of Upper (P_2) and Lower (P_1) Bollandian age. No unconformity has been found between the Namurian and the Visean though absence of the Pendleian (E_1), effected no doubt by the Sudetian earth movements, suggests that an unconformity is present.

Minor folding of the limbs of the synclinal area along a north-east/south-west axis was observed in the stream south of the Newtown stream section.

West of the Crossmacool Fault is a second fault causing a long narrow triangular area of D_2 rocks to lie against Lower Palæozoic rocks to the north-west and against rocks of similar D_2 age to the south-west. The latter are however of lower age stratigraphically, and appear to be gently folded along north-east/south-west axes parallel to those found further east in North County Dublin, at Mallahow House and Walshestown House.

To the north of the area the Lower Palæozoic Balbriggan massif occurs, but unfortunately the junction between it and the Carboniferous to the south is not seen. The junction may be a faulted one, or the Carboniferous strata may overlap onto the massif as they do further east in North County Dublin. At the junction of massif and basin shell reefs tend to form, and the occurrence of a reef fauna and facies at G73 is not surprising.

PALÆONTOLOGY.

(*a*) *Faunal Lists.*

(Numbers are of localities. Each locality symbol consists of a number preceded by the letter G indicating the district covered by this Report. The G has been omitted in the following lists).

Arnsbergian E_2.

Anthracoceras cf. *discoides* Bisat. 41.
Anthracoceras sp. 41.
Cordaites sp. 41.
Cravenoceratoides stellarum Bisat. 54.
Cravenoceras sp. 41. 54.

Posidonia membranacea McCoy. 41. 54.
Posidoniella cf. *corrugata* R. Etheridge, jun. 41.
P. cf. *elongata* Hind. 41.
P. laevis Brown. 41.
P. cf. *vetusta* Sowerby. 54.
Posidonomya aff. *wapanuckensis* Cirty. 54.
Fragment of an Orthocone Nautiloid. 54.

Upper Bollandian P_2.

Cordaites sp. 35. 38.
Orthoceras sp. 44.
Posidonia membranacea McCoy. 44. 12.
Posidoniella cf. *corrugata* R. Etheridge, jun. 44. 38. 85.
P. cf. *elongata* Hind. 38. 44. 85.
Posidoniella laevis Brown. 38. 44.
P. minor Brown. 44.
P. cf. *rugata* Jackson. 44. 85.
Posidonyma aff. *wapanuckensis* Girty. 44.
Sudeticeras sp. 38.

Lower Bollandian P_1 (D_2).

Actinoconchus cf. *planosulcatus* Phillips. 49.
Beyrichoceras sp. 25.
Choetetes sp. 25.
Chonetes cf. *buchiana* De Koninck. 25.
Goniatites maxima. 25.
Martinia glabra Martin. 49. 74.
Orthocone nautiloid. 25.
Posidoniella laevis Brown. 25.
Productus antiquatus J. Sowerby. 74.
P. cf. *aculeatus* Martin. 50.
P. derbiensis Muir Wood. 50.
Productus (*Dictyoclostus*) sp. 49.
P. cf. *furcatus* Muir Wood. 49.
P. hindi, var *wettonensis* Muir Wood. 49. 74.
P. insculptus Muir Wood. 49. 74.

P. productus Martin. 25. 74.
P. cf. *setosus* Phillips. 25. 74.
Productus sp. 76.
Pustula punctata Martin. 74.
P. pustulosa Phillips. 49.
Reticularia lineata Martin. 74.
Schelwienella sp. 50.
Schizophoria resupina Martin. 74.
Spirifera bisulcata Sowerby. 74. 76.
Stenopora dubia McCoy. 49.
Stenopora sp. 25.

Grey Limestones C_2—D_1.

Chonetes sp. 26.
Dibunophyllum cf. *bourtonense* Garwood and Goodyear. 26.
Lithostrotion cf. *clavaticum* Thomas. 26.
Productus sp. 26.

(*b*) *Fossil localities.*

E_2.

Stream 1,000 yards at 285° from Newtown House.
Stream 775 ,, 265° ,, Pluckhimin Cross Roads.

P_2.

Stream 1,490 yards at 254° from Newtown House.
Ditch 250 ,, 100° ,, ,, ,,
Stream 875 ,, 264° ,, ,, ,,
Quarry 790 ,, 270° ,, ,, ,,
Quarry 250 ,, 300° ,, Garristown.

P_1 (D_2).

Quarry 1,000 yards at 165° from Newtown House.
Quarry 433 ,, 12° ,, Tobergregan House.
Quarry 1,250 ,, 5° ,, Robinson's Cross Roads.
Quarry 580 ,, 10° ,, Piercetown House.
Exposure 1,865 ,, 182° ,, ,, ,,

C_2—D_1.

Quarry 1,870 yards at 114° from Garristown.

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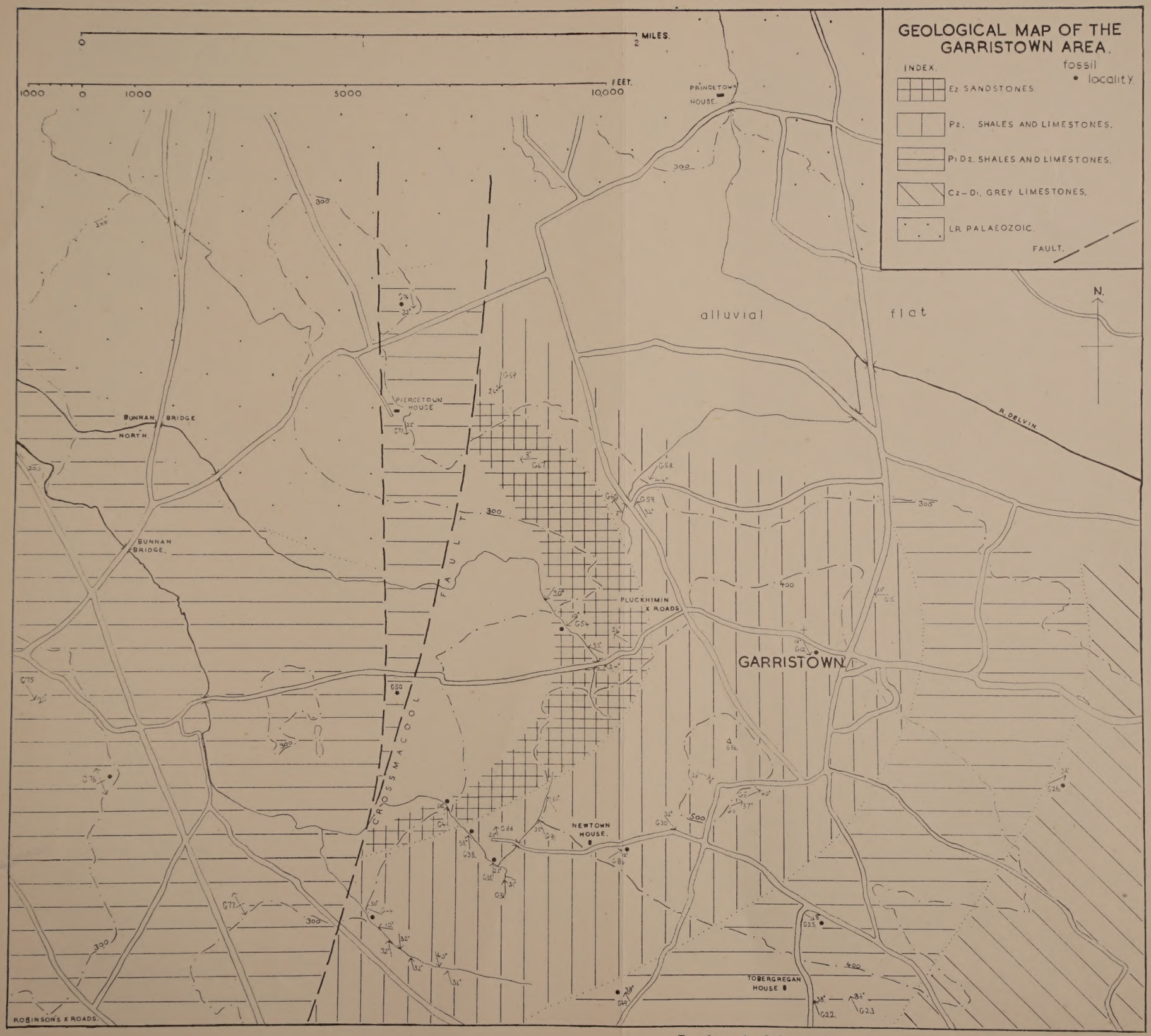

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